

LETTER TO PARENTS

Cut here and paste onto school letterhead before making copies.

Dear Parents,

Water is a unique earth material, the only material on Earth that occurs naturally in all three states of matter, solid, liquid, and gas. Next to the air we breathe, water is probably the most important thing in our lives. Your child will learn these interesting things and more as we investigate water, its properties, and what it can do in the **FOSS Water Module**.

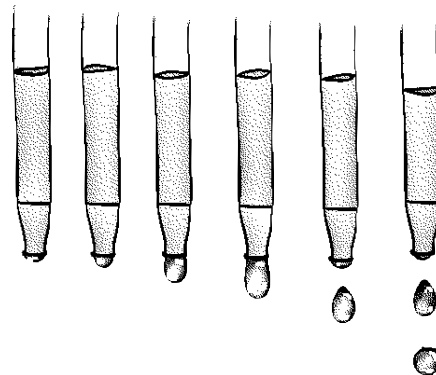
One of the goals of this module is to help students focus their observation skills on water—to begin seeing water in a new light. Through their investigations into the properties of water, how it reacts to heating and cooling, and the processes of evaporation and condensation, students will begin to appreciate how important this unique material is.

You can help your child focus on the properties of water and its uses in several ways. Take a trip to the public library and check out books about water, water conservation, and recycling. Plan a visit to a garden shop and find out more about irrigation systems. Visit a dam, reservoir, lake, or stream to observe the flow and interactions of water with the earth. Consider ways to conserve water in your home and community. A walk around the block after a rainstorm, looking for evidence of precipitation, condensation, evaporation, and flowing water, can also be eye-opening.

I will be sending home assignments called Home/School Connections. Please try to complete them with your child that evening and send them back to school the next day. When your child brings home another kind of sheet, called Response Sheet, he or she needs to complete it *without* your help. These sheets help me evaluate the development of your child's ideas about the science concepts he or she is learning.

We're looking forward to weeks of exciting investigations into the world of water!

Comments

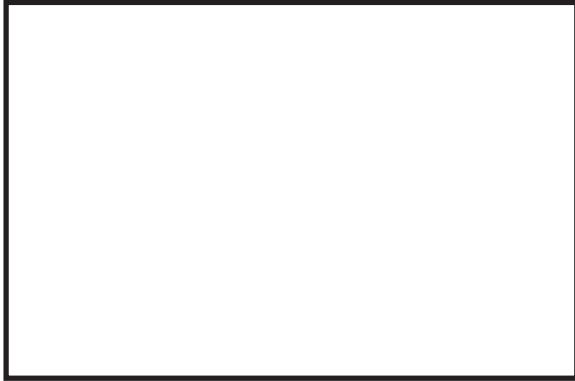


Name _____

Date _____

WATER ON SURFACES

Draw and describe what you observed when you put water on these surfaces.



WAX PAPER



PAPER TOWEL



ALUMINUM FOIL



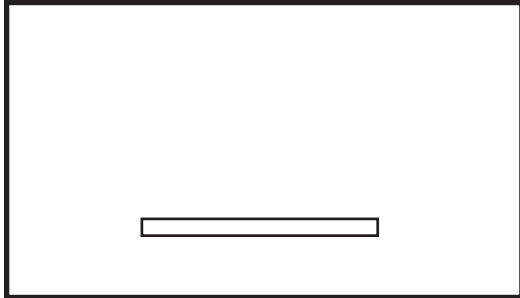
WHITE PAPER

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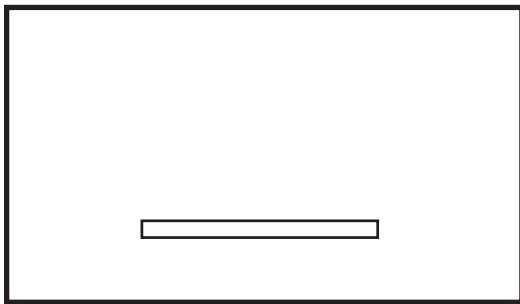
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SURFACE TENSION

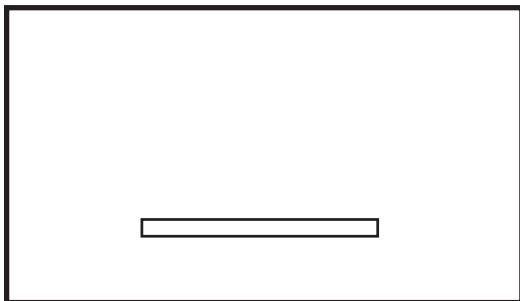
Draw and describe the shape of the water on the penny.



PLAIN WATER



SOAPY WATER



SALTY WATER

Describe surface tension in your own words.

Name _____

Date _____

WATER ON A SLOPE

.....

Describe what you observed when you placed water drops on a slope.

Which drops were the winners in your water races?

Date _____

.....

That evening there was a rainstorm. The student wrote this in her journal.

Write a note to this student. Explain any ideas you have about why the tent flooded and about what her family should think about next time they decide where to pitch their tent.

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Name _____

Date _____

BUILD A THERMOMETER

.....

What happened when you put the bottle-and-straw setup in a cup of hot water?

- Record what you observed on the "Hot water" picture below.
- Describe what you observed on the lines below.

What happened when you put the bottle-and-straw setup in a cup of ice water?

- Record what you observed on the "Cold water" picture below.
- Describe what you observed on the lines below.

What could you do to make the straw thermometer more useful?



Hot water



Cold water

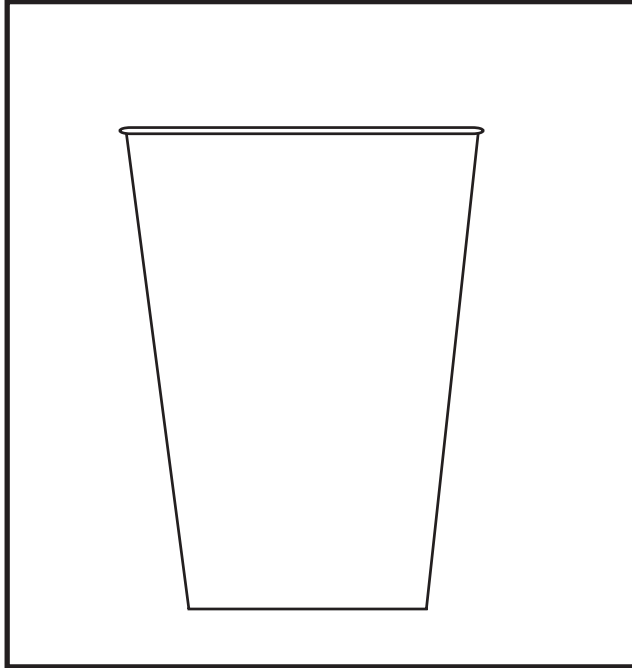
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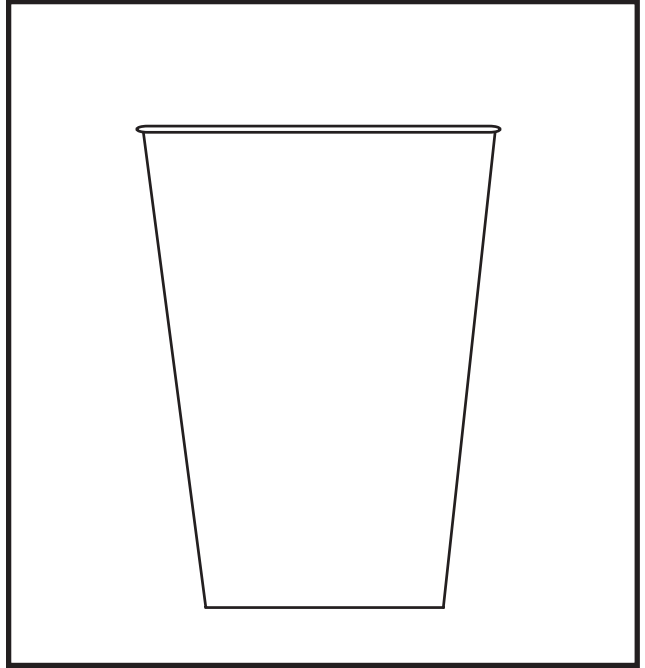
SINKING AND FLOATING WATER

.....

Draw a picture of what happened when you lowered **hot** water into a cup of room-temperature water.



Draw a picture of what happened when you lowered **cold** water into a cup of room-temperature water.



Which is denser, hot water or cold water? _____

How do you know?

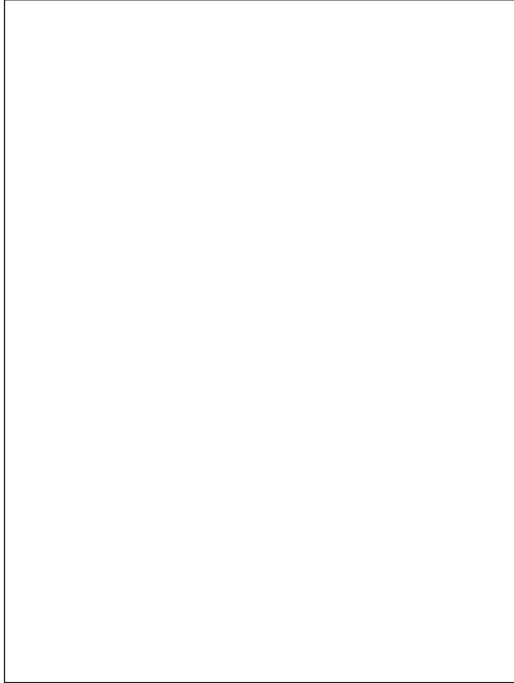
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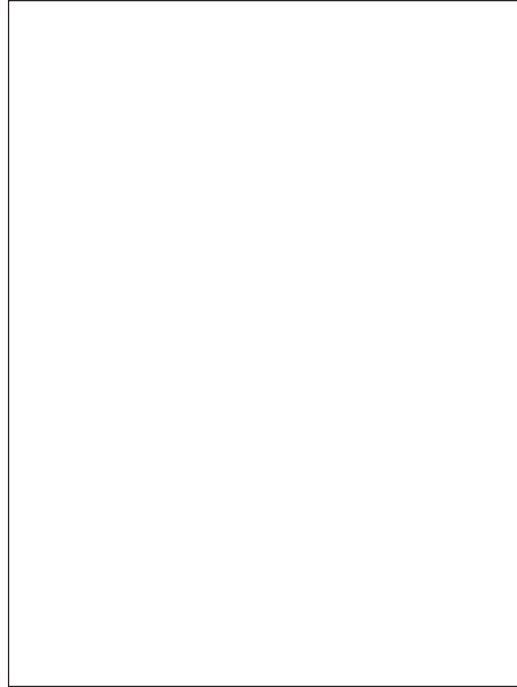
OBSERVING ICE

WATER IN VIALS

Draw a picture of a vial of liquid water.



Draw a picture of a vial of frozen water.



WATER IN SYRINGES

What was the volume of liquid water in the syringe before it froze? _____

What was the volume of the ice after you froze the water? _____

What was the difference in volume after you froze the water? _____

Write a sentence to describe what happens to the volume of water when you freeze it.

Name _____

Date _____

RESPONSE SHEET—HOT WATER, COLD WATER

.....

Last January it got very cold in a town in Wisconsin. The temperature was below -15°C for more than 7 days in a row. Students came into class on the third day, telling stories about water pipes bursting in their neighborhood.

Their teacher asked them to think about why this happened.

Write a note to this teacher. Explain why you think the pipes broke during this freezing cold weather.

Name _____

Date _____

EVAPORATION LOCATION CHARTS

.....

Amount of evaporation	Letter of location
Most evaporation	
Second most evaporation	
Third most evaporation	
Least evaporation	

Letter of location	Temperature of evaporation location
	Warmest location
	Second warmest location
	Third warmest location
	Coolest location

Where did the most water evaporate, at the warmest location or the coolest location?

Where did the least water evaporate, at the warmest location or the coolest location?

Name _____

Date _____

RESPONSE SHEET—WATER VAPOR

A student helped his mother carry in groceries from the car on a warm, sunny day. On the way into their apartment, he noticed that a bottle of water was cracked and had left a puddle on the sidewalk. When he went back outside, he noticed that the puddle was gone. Later that evening he wrote this note in his journal.

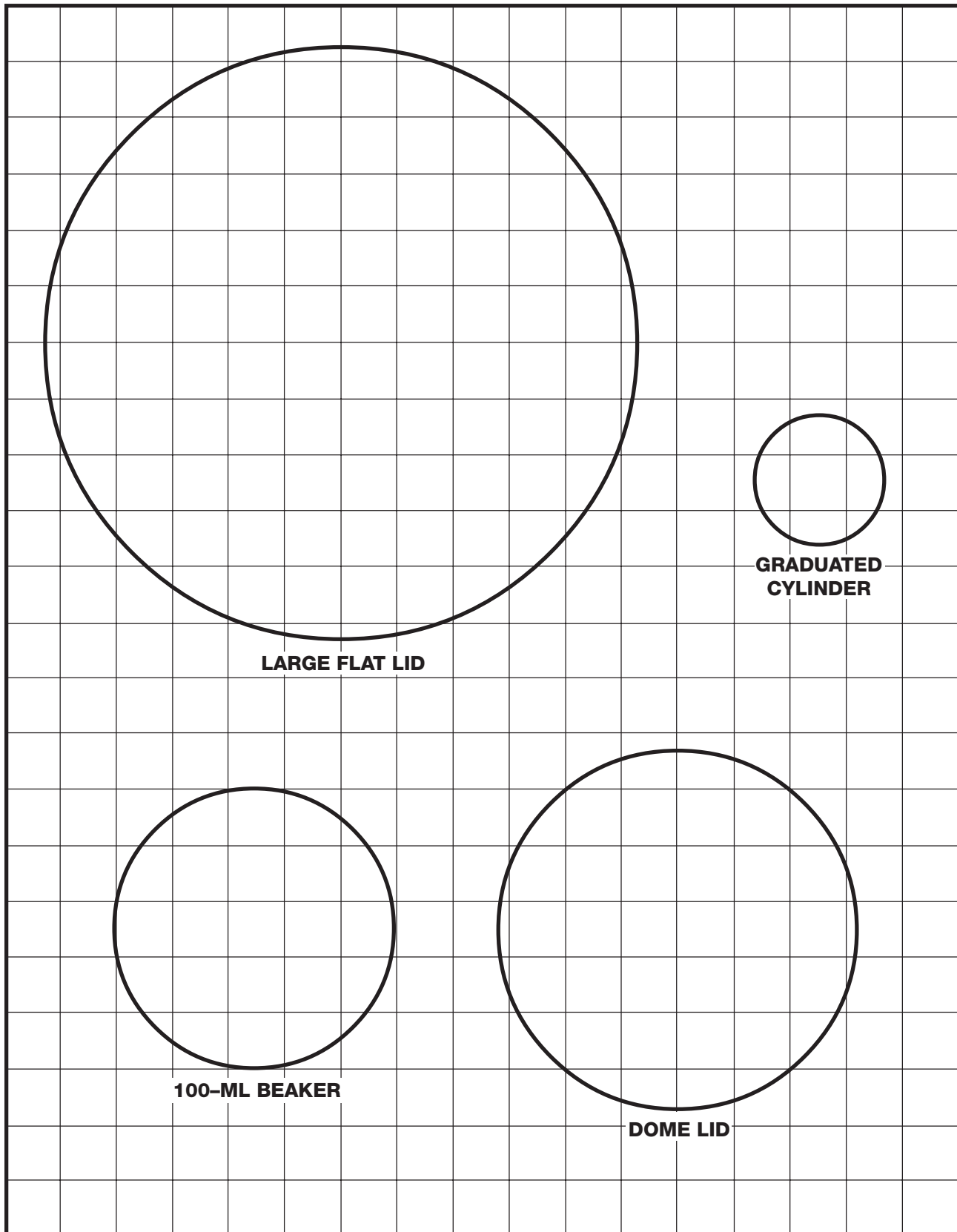
That puddle of water was a real mystery! It was about 25 cm across. When I came back outside about 15 minutes later after helping Mom put the groceries away, the puddle was gone. I wonder if the neighbor's cat drank the water. I hope they remember to put water in its bowl tonight.

Write a note to this student. Explain any ideas you have about why the puddle disappeared so quickly.

Name _____

Date _____

EVAPORATION PLACE MAT



Name _____

Date _____

SURFACE-AREA CHART

	Graduate	Beaker	Dome lid	Flat lid
Amount of water at start				
Amount of water at end				
Amount of water evaporated				
Ranking (1=most evaporated; 4=least evaporated)				

Why do you think you got these results for this investigation?

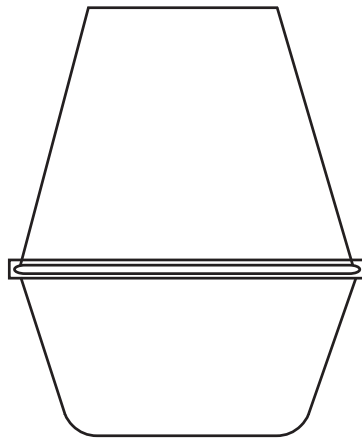
Name _____

Date _____

CONDENSATION OBSERVATIONS

Write a sentence to describe any changes you observed in the condensation chamber the day after you set it up.

Draw a picture here of what you observed.



List at least five places where you have observed condensation.

Choose one of the places on your list and explain why you think condensation happened.

WATER IN EARTH MATERIALS

Materials

- 2 Large plastic cups
- 2 Filter cups with holes
- 1 Plastic cup with gravel
- 1 Plastic cup with soil

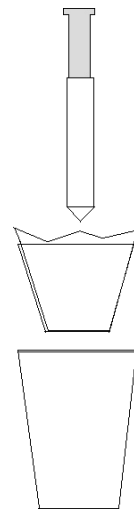
- 2 Filter papers
- 1 Balance
- 1 Syringe, 50-ml
- 1 Graduated cylinder
- 2 Hand lenses

PROCEDURE

1. Place a filter paper in each filter cup with holes.
2. Pour soil into one filter paper until the cup is three-quarters full.
3. Set the cup with the soil and filter paper on one side of the balance.
4. Set the cup with filter paper on the other side of the balance.
5. Add gravel to the empty filter paper until the balance is level. You should now have the same mass of soil and gravel in the two cups.
6. Put each cup in a large plastic cup.
7. Use the syringe to carefully squirt 50 ml of water in each filter cup. Observe what happens.
8. After the water has stopped draining into the large cup (about 5 minutes), put the soil and gravel cups on the balance. What do you notice?

MEASUREMENTS

Use the syringe and graduated cylinder to measure the amount of water that drained into the large cups. Record your answers below.

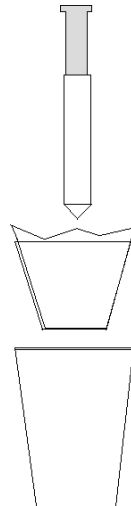


SOIL

Amount of water added with syringe _____

Amount of water left in soil _____

Amount of water drained into large cup _____



GRAVEL

Amount of water added with syringe _____

Amount of water left in gravel _____

Amount of water drained into large cup _____

Date _____

.....

Explain, step-by-step, what Gina should do to test the soils before she plants the seeds to see which drains the best. Be sure to tell how she will know which soil she should use.

[illegible]

Name _____

Date _____

PUTTING WATER TO WORK

.....

THE WATERWHEEL CHALLENGE

Use the following materials to make a waterwheel that can lift a mass on a string.

Materials

- | | |
|------------------------|------------------------|
| 5 Plastic disks | 3 Medium binder clips |
| 1 Basin | 1 String, 1 meter long |
| 1 Dowel for Waterwheel | 1 Container |
| • Water | 1 Syringe, 50-ml |

Work with your group to come up with a design for a waterwheel.

Draw a picture of your design here.

How many 50-ml syringefuls of water did you need in order to wind the string all the way up to the top? _____

Name _____

Date _____

COMPARING WATER SAMPLES

	Sample 1 collected by (name) _____	Sample 2 collected by (name) _____	Sample 3 collected by (name) _____	Sample 4 collected by (name) _____
source				
color				
clarity				
odor				
particles				
organisms				
evaporation results				
other observations				

PROJECT IDEAS

.....

- What materials besides soap can change the surface tension of water?
- How much water can a sponge absorb? A washcloth?
- How fast does a drop of water travel down a slope? On a steeper slope? Different-sized drops? What units should you use to describe the speed?
- What happens when you freeze different kinds of liquids, like milk or juices? Do they expand, contract, or stay the same volume when they freeze?
- Can you find a way to make ice sink in water?
- What happens when you float different objects in salt water? In other liquids? What do your observations tell you about the density of the objects compared to the liquid?
- How do different types of thermometers work?
- Look at the *FOSS Science Stories* or other books in the library for ideas about projects you might like to present to the class.
- Find out about irrigation and where it is used around the world.
- Can you use different materials to design a waterwheel that can pick up a 500-gram weight?
- Can you design another type of machine that uses water to do work?
- Where does the water in the drinking fountain at school come from?
- What types of chemicals can be added to aquarium water to make it the right quality for fish?
- What types of soil do you have in your community? Find out what happens when you add water to a sample.
- Can you figure out a way to cut down on the amount of condensation that occurs on your bathroom mirror when someone takes a shower?
- How do perspiration and evaporation help your body keep cool?

Name _____

Date _____

PROJECT PROPOSAL

1. What is the question or the project that you are proposing?

2. What materials or references will you need to complete the project?

3. What steps will you follow to complete the project?

Name _____

Date _____

PRESENTATION GUIDELINES

.....

You will have exactly 3 minutes to present your project to the class. In those 3 minutes you should answer these questions.

- What were you trying to find out (your question)?
- What materials or references did you need to do your project?
- What procedure did you follow to complete your project?
- What did you learn from doing your project?

When you begin speaking, you will see the *green card* held up for 2 1/2 minutes. When you see the *yellow card*, you have 30 seconds left. When you see the *red card*, it means you can finish your sentence, but you must stop within the next few seconds.

Practice your presentation so you will be sure it is at least 2 1/2 minutes long, but not more than 3 minutes long. Be sure you have included all of the information asked for above.

Name _____

Date _____

PRESENTATION GUIDELINES

.....

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Date _____

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[illegible]

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












Name _____

Date _____

MATH EXTENSION—PROBLEM OF THE WEEK**INVESTIGATION 1: WATER OBSERVATIONS**

Students in Mr. Li's class were trying to find out how big raindrops could get. On a rainy day, they placed a cookie sheet covered with flour outside for 15 seconds. Where raindrops hit the flour, little balls of flour formed. After an hour they separated the dry flour balls from the flour with a sieve.

The circles below are the diameters of the flour balls the students measured. Use a metric ruler to measure the diameters. Record your answers on the chart.

Drop	Diameter (mm)
	
	
	
	
	
	
	
	
	
	
	
	
	
	
	
	
	
	

Get a sheet of graph paper from your teacher. Use the data on the chart to make a graph to show the results. Then answer the questions.

How many drops did you measure?

What was the diameter of the largest drop?

What was the diameter of the smallest drop?

Which size raindrop fell most often?

Which size raindrop fell least often?

MATH EXTENSION—PROBLEM OF THE WEEK**.....
INVESTIGATION 2: HOT WATER, COLD WATER**

When Madeline's family goes camping, they freeze water in plastic jars with lids to put in their coolers to keep the food cool. Madeline's mother asked her to fill and freeze three jars of water. Madeline filled the jars all the way to the top and screwed on the lids. She put the jars in the freezer.

Two days later she went to the freezer to get the jars and found that all three jars had burst open. She wasn't going to be able to use them. Her mom asked her to try again. She gave her three new jars and suggested that Madeline put in just enough water, so that when it froze, ice would fill the jar just to the brim.

One jar held 500 ml, one held 1000 ml, and the third was a 2-liter bottle. Madeline remembered from science class that when they froze 45 ml of water, the ice expanded to fill 50 ml of space.

How can you use this information to figure out how much water Madeline should add to each jar so that, when it freezes, ice fills the jar just to the brim. Show your math in the space below.

How much water should Madeline put in each jar?

500-ml jar

1000-ml jar

2-liter jar

MATH EXTENSION—PROBLEM OF THE WEEK**INVESTIGATION 3: WATER VAPOR**

Some students set up an investigation to find out what effect surface area has on the rate of evaporation. They used four different containers: a round cake pan, a water glass, a cottage-cheese container, and an olive jar. They put 100 ml of water in each container.

Container	Diameter
Cake pan	23 cm
Water glass	7 cm
Cottage-cheese container	11 cm
Olive jar	5 cm

The students observed the containers for 6 days. They measured the water on days 2, 4, and 6. The results of their measurements are on the chart below.

Container	Water remaining on		
	Day 2	Day 4	Day 6
Cake pan	75 ml	50 ml	25 ml
Water glass	90 ml	80 ml	70 ml
Cottage-cheese container	80 ml	60 ml	40 ml
Olive jar	95 ml	90 ml	85 ml

In which container will all of the water evaporate first? _____

If conditions stay the same, on which day will all of the water evaporate from this container? Show your math on the back of this page. _____

In which container will all of the water evaporate last? _____

If conditions stay the same, on which day will all of the water evaporate from this container? Show your math on the back of this page. _____

MATH EXTENSION—PROBLEM OF THE WEEK

INVESTIGATION 4: WATERWORKS

In the chart below, column 1 lists nine different things people do that need water. Column 2 shows how much water each activity typically consumes, and column 3 shows how much each activity consumes when people conserve. Figure out the amount of water your family uses in a week and write those totals in column 4. If your family is not conserving at this time, figure out how much you could conserve. Write those numbers in column 5.

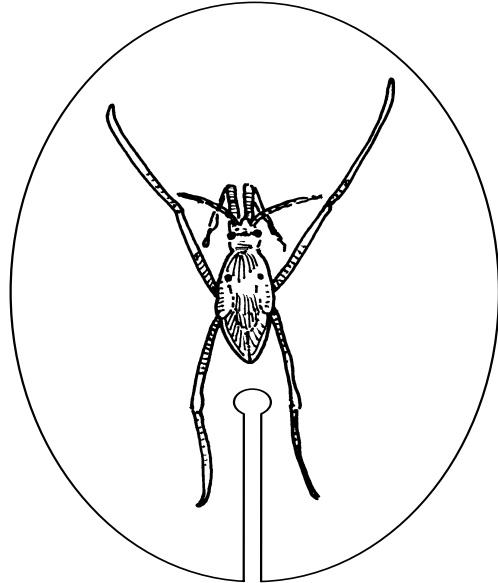
Column 1	Column 2	Column 3	Column 4	Column 5
Activity	Normal use	Conservation use	Weekly family use	Amount we could save
Shower	Water running 110 liters	Wet down, soap, rinse off 18 liters		
Brushing teeth	Tap running 44 liters	Wet brush, rinse briefly 2 liters		
Tub bath	Full 264 liters	Low level 110 liters		
Toilet flushing	Large tank 26 liters	Displacement in tank 22 liters		
Washing dishes	Tap running 198 liters	Wash and rinse in basin 22 liters		
Electric dishwasher	Full cycle 62 liters	Short cycle 48 liters		
Shaving	Tap running 88 liters	Fill basin 4 liters		
Washing hands	Tap running 9 liters	Fill basin 4 liters		
Washing machine	Full cycle, top water level 154 liters	Short cycle, low water level 110 liters		
Totals				

Figure out the total amount of water your family uses each week and the total amount your family could conserve. Write your answers in the bottom of the last two columns.

HOME/SCHOOL CONNECTION

INVESTIGATION 1: WATER OBSERVATIONS

Try these activities at home. Make sure you work in a place where it's OK to spill a little water. Record your observations on another sheet of paper.



WATER STRIDER

1. Cut out the water strider along the line. Also cut out the notch at the bottom.
2. Float the paper water strider in 6–10 cm of water in a sink or plastic basin.
3. Use a toothpick to place a tiny amount of dishwashing liquid in the top of the notch near the strider's abdomen. How can you explain what happened?

PAPER CLIPS IN FULL GLASS OF WATER

1. Fill a small drinking glass with water clear to the brim.
2. Carefully add paper clips, one at a time, to the glass of water.
3. Observe the glass from the side. What shape is the water's surface?
4. How many paper clips can you add before the water spills over the edge of the glass?
5. Why do you think you could add paper clips to the glass when it was already filled to the brim?

BERRY BASKET

1. Next time your family has strawberries, save the plastic basket they came in.
2. Float the berry basket, like a boat, in 10–15 cm of water in a sink or plastic basin. Observe the shape of the water in the squares at the bottom of the berry basket.
3. Add one drop of dishwashing liquid to the water in the middle of the berry basket. What do you observe? Why did it happen?

Name _____

Date _____

HOME/SCHOOL CONNECTION

INVESTIGATION 2: HOT WATER, COLD WATER

Water is essential for life. You take in water every day. Some of the water you drink when you are thirsty, but a lot of the water you need comes from food.

Water is used in the preparation of a lot of foods. Work with family and friends to find out where water is used in food preparation. For instance, preparing rice takes water. How much? Some kinds of instant cocoa and soups say on the package, "Just add water!"

Look around your kitchen or take a field trip to the market and look for products that use water as part of the preparation. Write the food or product in the "Food" column below, the size or number of servings in the "Servings" column, and the amount of water in the "Water" column. The first two are filled in as starters.

Food	Servings	Water
Instant cocoa	1	1 cup
Rice	4	3 cups

Is the water used in food preparation all eaten, or is some thrown away? Put a check by the foods in the list above if all the water is eaten.

HOME/SCHOOL CONNECTION

INVESTIGATION 3: WATER VAPOR

INVISIBLE WATER

1. Moisten your forearm with a damp washcloth.
2. Either blow gently on the wet spot or fan your arm with a stiff sheet of paper.
 - How does the wet spot on your arm feel? What happens to the water on your arm?
 - How does sweating help to keep your body cool?

NOTE: It takes heat to evaporate water and turn it into water vapor.

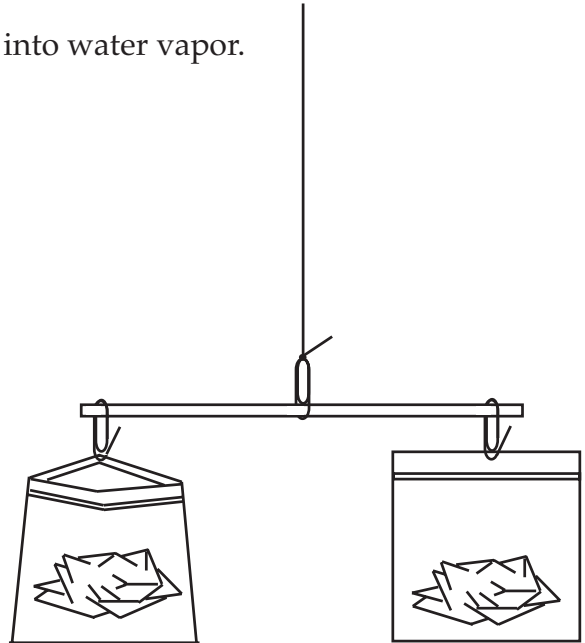
INTO THIN AIR

How fast does water evaporate in your home?

Set up an evaporation gizmo and find out.

You will need

- 1 Plastic soda straw
- 3 Paper clips, regular size
- 1 Piece of string about a meter long
- 2 Plastic bags, identical (zip-type is nice)
- 2 Paper towels



1. Slide a paper clip on each end of the straw and open them up a bit to make hooks.
2. A third paper clip is the pivot point. Tie the string here.
3. Moisten the paper towels. Put one in each bag. Seal one bag and leave the other open.
4. Hang the bags on the two hooks. Slide things around until balance is achieved.
5. Hang the whole rig where it can be monitored closely. Observe.

THINK ABOUT HUMIDITY

Where did the water go? The amount of water vapor in the air is called **humidity**. When air contains as much water vapor as it can possibly hold, the humidity is 100%. Warm air can usually hold more water vapor than cool air.

- Watch a weather report or read one in the newspaper. What is the local humidity?
- How could the humidity of the air change the rate of evaporation?